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(54) **LIGHT EMITTING DEVICE, ELECTRODE STRUCTURE AND MANUFACTURING METHOD THEREOF**

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(58) **Field of Classification Search**
CPC H01L 51/5203; H01L 51/0023; H01L 51/5012; H01L 51/56
See application file for complete search history.

(56) **References Cited**

U.S. PATENT DOCUMENTS

6,812,637 B2 11/2004 Cok et al.
7,495,389 B2 2/2009 Noguchi et al.
(Continued)

FOREIGN PATENT DOCUMENTS

CN 102171851 8/2011
CN 102593194 7/2012
(Continued)

OTHER PUBLICATIONS

Park et al., "Luminance Uniformity of Large-Area OLEDs With an Auxiliary Metal Electrode , " Journal of Display Technology, Aug. 2009, pp. 306-311.
(Continued)

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(57) **ABSTRACT**

A light emitting device including a substrate, a first electrode structure, an organic light emitting structure and a second electrode structure is provided. The first electrode structure includes a first transparent conductive layer, a patterned conductive layer and a second transparent conductive layer disposed on the substrate in sequence, so that the patterned conductive layer is interposed between the second transparent conductive layer and the first transparent conductive layer in a thickness direction of the substrate. The organic light emitting structure and the second electrode structure are disposed on the substrate, and the organic light emitting structure is located between the first electrode structure and the second electrode structure in the thickness direction of the substrate. An electrode structure and a manufacturing method thereof are also provided.

21 Claims, 15 Drawing Sheets